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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/540,924   | 06/29/2005  | Junichi Doi          | 273353US0PCT        | 8100             |
| 22850  | 7590        | 09/26/2006           | EXAMINER            |                  |
| C. IRVIN MCCLELLAND<br>OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.<br>1940 DUKE STREET<br>ALEXANDRIA, VA 22314 |             |                      | VALENROD, YEVGENY   |                  |
|  |             |                      | ART UNIT            | PAPER NUMBER     |
|  |             |                      | 1621                |                  |

DATE MAILED: 09/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/540,924

Applicant(s)

DOI ET AL.

Examiner

Yevgeny Valenrod

Art Unit

1621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>6/29/05</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 3 and 4 recite the limitation "Wherein after the conversion of the alcohol or the phenol has exceeded 97%" in line 3 (in both claims). There is insufficient antecedent basis for this limitation in the claim. The independent claims 1 and 2 recite a limitation "the conversion of the alcohol or the phenol is within the range of 10 to 90 %" (line 12 of claim 1, line 14-15 of claim 2).

Claims 3 and 4 recite the limitation "temperature of the uppermost stage in the distillation column may be 95°C or higher, and the temperature of the middle stage and the lowest stage in the distillation column may be 95°C or higher " in lines 5-7 (in both claims). There is insufficient antecedent basis for this limitation in the claim. The independent claims 1 and 2 recite a limitation "Uppermost stage in the distillation column may be from 63 to 68°C, a temperature of the middle stage in the distillation column may be from 68-90°C, and a temperature of the lowest stage in the distillation column may be from 90 to 100°C" in lines 8-10 of claim 1, 8-11 of claim 2 (the language is slightly different in claim 2 but same rejection applies).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mirabelli (US 5,037,978).

Instant claims 1-4 are directed towards a method of producing methacrylic acid ester via trans-esterification reaction. The said process comprises removal of methanol as azeotropic mixture with methyl methacrylate via distillation while keeping the reaction under reflux. Limitations are directed to temperature of the distillation column and % conversion of alcohol. The temperature of the various stages of the distillation column is as follows:

Uppermost stage - 63 to 68°C, middle stage - 68-90°C, and a lowest stage - 90 to 100°C for claims 1 and 2;

Uppermost stage - 95°C or higher, middle and lowest stages - 99°C or higher, for claims 3 and 4.

The % conversion of alcohol or phenol is 10-90% in claims 1-2 and >97% in claims 3-4.

***Scope of prior art***

Mirabelli describes a method of producing methacrylic acid ester via trans-esterification reaction (Column 5, example 1). In the said process the by-product

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methanol is removed as azeotropic mixture with methyl methacrylate via distillation at reflux (lines 25-28). The temperature at the top of the reflux column is 65-67°C (line 30) and the % conversion of isodecanol to isodecyl methacrylate is >99.9% (line 35).

*Ascertaining the difference between prior art and the instant claims*

Mirabelli fails to disclose the temperatures of the middle and the lower stages of the distillation column. He also fails to disclose the increase of the temperature in the distillation column indicating the end of the reaction. The % conversion of the alcohol disclosed by Mirabella is greater than 99.9%, while in the instant claims 1 and 2 it is 10-90%.

*Obviousness*

The experimental conditions described by Mirabelli in example 1 (column 5) suggest the limitations of the instant claims in a manner that renders the limitations obvious to a person of ordinary skill in the art.

Temperature of the distillation column:

-The gradient. (claims 1 and 2)

Mirabelli discloses the temperature at the top of the column to be 65-67°C while the reflux pot temperature is 106-124°C. It is well known in the art that the temperature at any stage of the distillation column reflects the boiling point of the compound being distilled. The Boiling point of methanol is 64.6°C while the boiling point of methyl methacrylate is 100°C. Accordingly, while undergoing the multiple evaporation/condensation cycles of a fractional distillation column the abundance of lower boiling component (methanol) is increased as the vapor rises up the distillation

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column and the abundance of the higher boiling component is higher towards the bottom of the distillation column, which explains the observed gradient in the distillation column. In Mirabelli's case the temperature at the top of the column is near the boiling point of methanol. Mirabelli also states that methanol is distilled as an azeotropic mixture with methyl methacrylate (same as in the instant claims). It is therefore obvious to a person of ordinary skill in the art that the distillation column will form a gradient similar to the one described by the applicant.

-Increase in column temperature at the end of reaction

One of ordinary skill in the art would also recognize the effect removal of methanol would have on the temperature of the distillation column. Once all the alcohol or phenol added to the reaction mixture has reacted, methanol will no longer be produced. When methanol is removed from the refluxing reaction mixture the higher boiling component is now rises up the distillation column and temperature increases at all stages of the column reflect the boiling point of the higher boiling component (100<sup>0</sup>C for methyl methacrylate). The applicant observes this phenomenon when in claims 3 and 4 the temperature of the uppermost section of the distillation column is recorded at greater than 95<sup>0</sup>C. It would therefore be obvious from the experimental conditions described by Mirabelli, that once all the isodecanol has reacted and no more methanol is produced, the temperature of the of the vapor at all stages of the distillation column would rise to reflect the boiling point of methyl methacrylate.

Difference in % conversion of alcohol or phenol.

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Since the % conversion of isodecanol reported by Mirabelli is higher than what is claimed by the applicant, it is obvious that had Mirabelli stopped the reaction prior to its completion the % conversion would be lower. It is obvious to a person of ordinary skill in the art that before getting to >99.9% conversion Mirabelli's process had to be at a point where the conversion is between 10 and 90%.

### ***Conclusion***


Claims 1-4 are pending

Claims 1-4 are rejected

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yevgeny Valenrod whose telephone number is 571-272-9049. The examiner can normally be reached on 8:30am-5:00pm M-F.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thurman Page can be reached on 571-272-0602. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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